



# Soil and Sediment Study Summary

**Citizens' Environmental Sampling Committee**

**Soil and Sediment Study of Off-Site Areas  
Surrounding the Rocky Flats Nuclear Weapons Plant**

**Executive Summary  
(September 1996)**

## **Introduction**

The following summarizes a soil and sediment sampling study of off-site areas surrounding the Rocky Flats Nuclear Weapons Plant. This study was designed and conducted by a group of interested citizens assisted by technical consultants, which came to be known as the Citizens' Environmental Sampling Committee (CESC). The CESC sampling activities were conducted in 1993 and 1994. The CESC project had its origins in long-standing public concern about the possible impact Rocky Flats Plant operations had on the health of nearby residents. Addressing these public health concerns was the mission of the parent study, the Historical Public Exposures Studies of the Rocky Flats Plant.

## **Origins of the Historical Public Exposures Studies**

Public distrust in the agencies and contractors that managed the Rocky Flats Plant began in the early 1970s when scientists measured radioactive contamination in off-site locations. This distrust intensified as a result of the inherent conflict between the public's desire for detailed information and the federal government's role in maintaining confidentiality in the interest of national security. Relevant information about the Rocky Flats Plant was misrepresented or withheld.

After the 1989 FBI raid on the Rocky Flats Plant, an agreement between the State of Colorado and the Department of Energy (DOE) provided financial support for various health related and environmental studies administered by the Colorado Department of Public Health and Environment (CDPHE).

Among these programs was the Historical Public Exposures Studies on Rocky Flats. A Health Advisory Panel was appointed by the Governor of Colorado to oversee these studies and advise the CDPHE-selected contractors. It soon became apparent to the panel that Rocky Flats Plant records of contaminant releases were incomplete and that the task of assembling quality exposure data would be difficult.

A Health Advisory Panel task force met in 1992 to consider whether these inadequate records could be augmented by past and ongoing environmental soil sampling. This sampling task force decided that because of public distrust of government agencies and its contractors, reliance on these sampling studies alone would not suffice.

## **Origins of the Citizens' Environmental Sampling Committee**

The Health Advisory Panel task force wanted to involve the public directly. In late 1992, representatives of various groups, including homeowners' associations, public interest organizations, local health departments, as well as individuals concerned about Rocky Flats, were invited to participate as a group to consider and conduct a soil-sampling

study.

The study was designed to fill gaps where there were no existing data or where data were in question, and to generate a data set that could be used for comparison with results of other off-site sampling studies. The first meeting of the CESC was held in December 1992.

During its study, the Citizens' Environmental Sampling Committee did the following:

- Selected sampling locations
- Determined analytes (contaminants) of concern
- Procured the analytical contract laboratory used for sample analyses
- Selected sampling procedures
- Conducted soil and sediment sampling activities
- Evaluated the quality of the data
- Assessed sampling result
- Prepared the report

The CESC selected 28 soil-sampling sites, most of which were within a five to six mile radius of the Rocky Flats Plant. At each site, two samples were collected: one surface soil sample (0 to 1 inch deep) and one soil core sample (0 to 8 inches deep).

In addition, one sediment core sample, divided into 10 one-inch layers, was taken at Standley Lake, a reservoir southeast of the Rocky Flats Plant. This reservoir serves as a drinking water supply for three nearby communities.

Samples were analyzed for isotopes of plutonium (plutonium-238, plutonium-239,240), americium (americium-241), cesium (cesium-137), strontium (strontium-90) and uranium (uranium-235, uranium-238).

### **Citizens' Environmental Sampling Committee Sampling Results**

The results of the study correlated well with the concentrations and distribution of radionuclides found by other studies of the area. A number of soil samples did have levels of plutonium-238, plutonium-239,240, americium-241, cesium-137, and strontium-90 above the background levels for this area. Background values for these radionuclides are the expected amounts in soils from nuclear testing and other global fallout. With the exception of strontium-90, almost all elevated levels were found in the surface soil samples. These results are consistent with the deposition and transport mechanisms associated with the Rocky Flats Plant region. Off-site contamination has been dispersed as airborne emissions, transported through surface water to local creeks or resuspended as wind-dispersed soil particles.

Six of the 28 surface soil sites yielded samples that contained plutonium-239,240 at levels above 0.084 picocuries per gram of soil (pCi/g). This value of 0.084 pCi/g is a statistical estimate of the upper limit of background concentrations due to global fallout

along the Front Range. Plutonium-239,240 concentrations at these six sites ranged from 0.09 to 4.5 pCi/g. The highest level of off-site plutonium was found approximately one mile

east of the Rocky Flats Plant near Great Western Reservoir. This sampling site with the highest surface soil concentration of plutonium also yielded a core sample containing plutonium-239,240 above the upper limit of background.

Sampling methodologies used by Colorado State University and EG&G, the DOE contractor at Rocky Flats, were compared by sampling three locations within three miles of the Rocky Flats Plant. Two of these locations yielded four samples containing levels of plutonium above the upper limit of background, with results varying from 0.09 to 2.4 pCi/g. One of these sample sites, with a value of 0.26 pCi/g, is located two miles southeast of the Rocky Flats Plant, south of Standley Lake.

Plutonium-239,240 and cesium-137 were found in the deeper layers of the sediment core sample from Standley Lake. These concentrations are consistent with known periods of release of radioactive material from the Rocky Flats Plant (e.g., the 1969 fire and the 903 Pad area) and the deposition of materials from global nuclear fallout during some of those same time periods.

In addition, background levels of cesium-137 and strontium-90 were detected in some soil samples. Cesium-137 and strontium-90 are generally associated with nuclear chain reactions. The Rocky Flats Plant never operated a full-scale nuclear reactor, but criticality experiments were conducted and wastes containing these radionuclides may have been disposed of at the Rocky Flats Plant site. No evidence has been found to suggest that cesium-137 or strontium-90 were released during the operational period of the Rocky Flats Plant.

#### **What the Citizens' Environmental Sampling Committee Results Mean**

The sampling results confirm conclusions from past soil studies: plutonium was released by the Rocky Flats Plant to the nearby off-site environment, generating soil concentrations above the upper limit of background expected from nuclear weapons testing fallout. The elevated plutonium values correspond in magnitude and location to those reported by other researchers, but the scope of this study cannot exclude the possibility of having missed hot spots.

Care must be exercised in drawing further conclusions from this and similar studies. The CESC study was not designed to estimate total contaminant releases from the Rocky Flats Plant. However, it was intended to produce a picture of off-site conditions at specific locations at the time of sampling. An inventory of total amounts of plutonium released from the Rocky Flats Plant cannot be derived from such environmental studies.

High-wind events typical of the Rocky Mountain Front Range area are known to resuspend and further disperse contaminants in soil. The amount of plutonium moved over the years by this mechanism, as well as exposure to people during these wind events, cannot be determined by static soil sampling. Complete analyses of these potential exposures and corresponding risks from historical releases of radionuclides from the Rocky Flats Plant will be estimated in the final reports of the parent project, the Historical Public Exposures Studies.

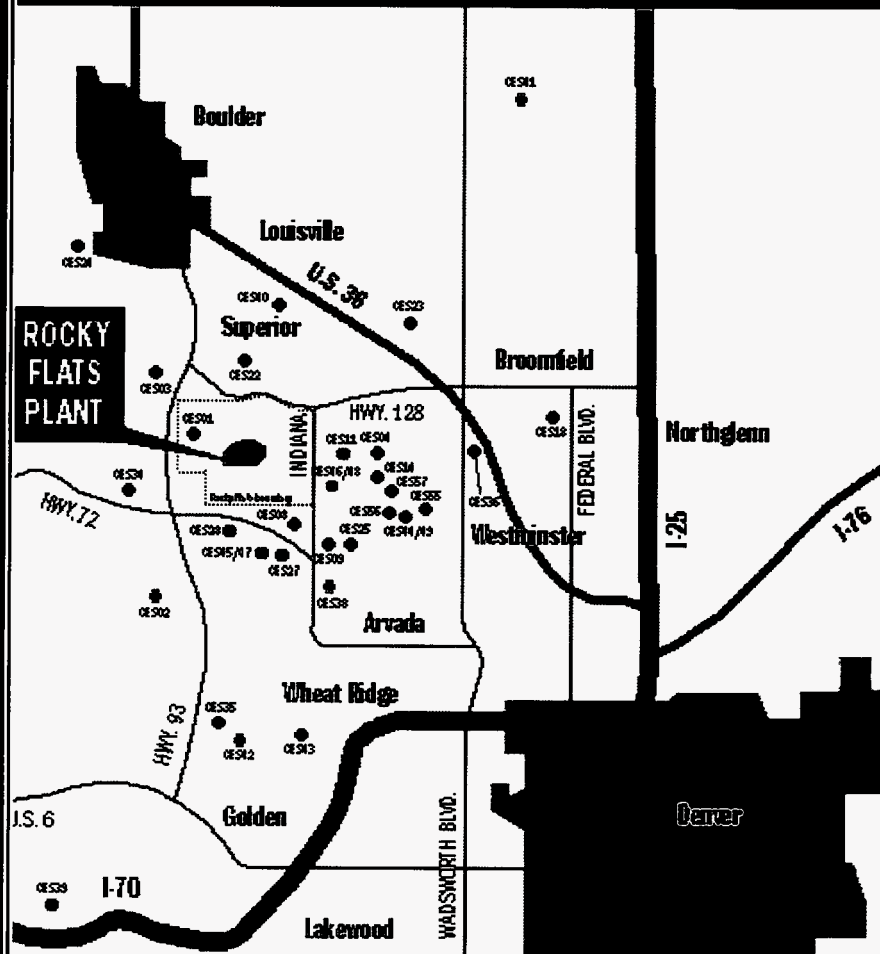
The key contributions made by the CESC sampling study are:

- (1) unique participation by citizens in designing and implementing the study independent of government influence, and
- (2) collection of additional soil and sediment data that can be added to existing sampling

data sets of the off-site environment surrounding the Rocky Flats Plant.

The CESC data from locations that had not been sampled previously create a better understanding of the environment surrounding the Rocky Flats Plant. The CESC data from sites that have been sampled in the past by other studies are available for purposes of comparison with these other studies.

**FIGURE 1: CESC SAMPLING LOCATIONS**



For more information on the Historical Public Exposures Studies of the Rocky Flats Plant, please contact the Colorado Department of Public Health and Environment (CDPHE).

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